

WHAT IS CLAIMED IS:

1. A birefringence measuring apparatus,  
comprising:

5 a light projecting unit for projecting  
approximately circularly polarized light upon a  
sample;

a Stokes meter for detecting a state of  
polarization of light from the sample; and

10 calculating means for calculating  
birefringence of the sample on the basis of a  
Stokes parameter from said Stokes meter.

2. An apparatus according to Claim 1,  
wherein said light projecting unit includes a  
15 light source and converting means for converting  
light from the light source into approximately  
circularly polarized light.

3. An apparatus according to Claim 2,  
20 wherein said converting means includes a phase-  
difference plate.

4. An apparatus according to Claim 2,  
wherein the light from the light source has a  
25 wavelength not greater than 370 nm.

5. An apparatus according to Claim 2,

wherein the light from the light source has a wavelength not greater than 200 nm.

6. An apparatus according to Claim 1,  
5 further comprising a dividing unit including three optical elements having the same reflection characteristic and the same transmission characteristic.

10 7. An apparatus according to Claim 1, wherein said calculating means calculates the birefringence of the sample on the basis of the following equations:

$$B = \frac{\pi}{2} - \arcsin\left(\frac{S_3}{S_0}\right)$$

15 
$$\phi = -\frac{\pi}{4} + \frac{1}{2} \arctan\left(\frac{S_2}{S_1}\right)$$

where B is the amount of birefringence,  $\phi$  is a phase advance axis angle,  $S_0 - S_3$  are Stokes parameters wherein  $S_0$  is a total light quantity,  $S_1$  is a horizontal linear polarization component,  
20  $S_2$  is a +45 degree linear polarization component, and  $S_3$  is a clockwise circular polarization component.

8. An apparatus according to Claim 1,  
25 further comprising a memory for memorizing

birefringence measured by said birefringence  
measuring apparatus without a sample, wherein said  
calculating means calculates the birefringence of  
the sample also on the basis of the birefringence  
5 memorized in said memory.

9. A birefringence measuring apparatus,  
comprising:

a light projecting unit for projecting  
10 approximately circularly polarized light upon a  
sample;

a plurality of light receiving portions  
for detecting a light quantity of light from the  
sample; and

15 calculating means for determining a  
Stokes parameter on the basis of detected values  
at said plurality of light receiving portions, and  
for detecting birefringence of the sample on the  
basis of the Stokes parameter.

20

10. A birefringence measuring apparatus,  
comprising:

a light projecting unit for projecting  
approximately circularly polarized light upon a  
25 sample;

a plurality of light receiving portions  
for detecting a light quantity of light from the

sample;

a memory for memorizing birefringence  
measured by said birefringence measuring apparatus  
without a sample; and

5           calculating means for detecting  
birefringence of the sample on the basis of  
detected values at said plurality of light  
receiving portions and the birefringence memorized  
by said memory.

10

11. A birefringence measuring apparatus,  
comprising:

light projecting means for projecting  
approximately circularly polarized light upon a  
15 sample;

at least one dividing unit for dividing  
output light from the sample into two light beams  
having the same polarization state;

at least one polarizer;  
20 at least one phase-difference plate;  
at least two light receiving portions;  
and

calculating means for calculating a  
quantity of received light at said at least two  
25 light receiving portions.

12. A birefringence measuring apparatus,

comprising:

light projecting means for projecting approximately circularly polarized light upon a sample;

5 at least one dividing unit for dividing output light from the sample into two light beams having the same polarization state;

at least one polarizer;

at least four light receiving portions;

10 and

calculating means for calculating a quantity of received light at said at least four light receiving portions,

wherein the birefringence of the sample  
15 is measured without rotating the sample and said at least one polarizer.

13. A birefringence measuring apparatus, comprising:

20 light projecting means for projecting approximately circularly polarized light upon a sample;

at least two dividing units for dividing output light from the sample into two  
25 light beams having the same polarization state; and

four light receiving portions,

wherein a first light beam having the same polarization state as the output light from the sample is incident on one polarization dividing means whereby the first light beam is  
5 divided into two light beams having two orthogonal polarization components which beams are then received by light receiving portions, respectively, wherein, regarding a second light beam having the same polarization state as the output light from  
10 the sample, a polarization component different by 45 deg. from the two orthogonal polarization components is detected by a light receiving portion through a polarizer, and wherein, regarding a third light beam having the same  
15 polarization state as the output light from the sample, only a circular polarization component is detected by a light receiving portion through a phase-difference plate and a polarizer, whereby the amount of birefringence of the sample is  
20 measured.

14. A birefringence measuring apparatus, comprising:

light projecting means for projecting  
25 approximately circularly polarized light upon a sample;

at least three dividing units for

dividing output light from the sample into two light beams having the same polarization state as the output light from the sample; and

four light receiving portions,

5            wherein a first light beam having the same polarization state as the output light from the sample is incident on a first polarizer, and a first polarization component is detected by a first light receiving portion,

10           wherein a second light beam having the same polarization state as the output light from the sample is incident on a polarizer, and a second polarization component orthogonal to the first polarization component is detected by a  
15           second light receiving portion,

             wherein a third light beam having the same polarization state as the output light from the sample is incident on a polarizer, and a third polarization component being different by 45 deg.  
20           from the first polarization component is detected by a third light receiving portion, and

             wherein a fourth light beam having the same polarization state as the output light from the sample is incident on a phase-difference plate  
25           and a polarizer, and a circular polarization component is detected by a fourth light receiving portion, wherein the amount of birefringence of

the sample is measured.

15. A method of measuring birefringence,  
comprising the steps of:

5               projecting approximately circularly  
polarized light upon a sample;

              detecting a light quantity of light  
from the sample;

              determining a Stokes parameter on the  
10 basis of the detection of the light quantity; and

              detecting birefringence of the sample  
on the basis of the Stokes parameter.

16. A method according to Claim 15, wherein,  
15 in said birefringence detecting step, the  
birefringence of the sample is detected also on  
the basis of birefringence measured without a  
sample.